Part 2:

Code Provided:

```
package tsp;

import java.util.*;

public class tsp implements Runnable
{
    int size;
    int routes[][];//edges
    String cities[];//vertices

    Thread runners[];
    int threadCompleteCount;

    String solution;
    int totDistance;

    tsp()
    {
        try
        {
            int  i, j;
            String choice;

            Scanner scan = new Scanner(System.in);
            System.out.println("Enter the number of cities ");

            size = scan.nextInt();
            scan.skip("\n");

            cities = new String[size];
            routes = new int[size][size];

            System.out.println("Set city names : ");
            for(i=0; i< size; i++)
            {
                System.out.println("City " + (i+1) );
                cities[i] = scan.nextLine();
            }

            System.out.println("Set interconnecting routes ");
            for(i =0; i< size; i++)
            {

                for(j =i+1; j<size; j++ )
                {
                    System.out.println("Is there a route between " + cities[i] + "
and " + cities[j] + "(y/n) : " );
                    choice = scan.nextLine();
                    if(choice.equalsIgnoreCase("y"))
                    {
```

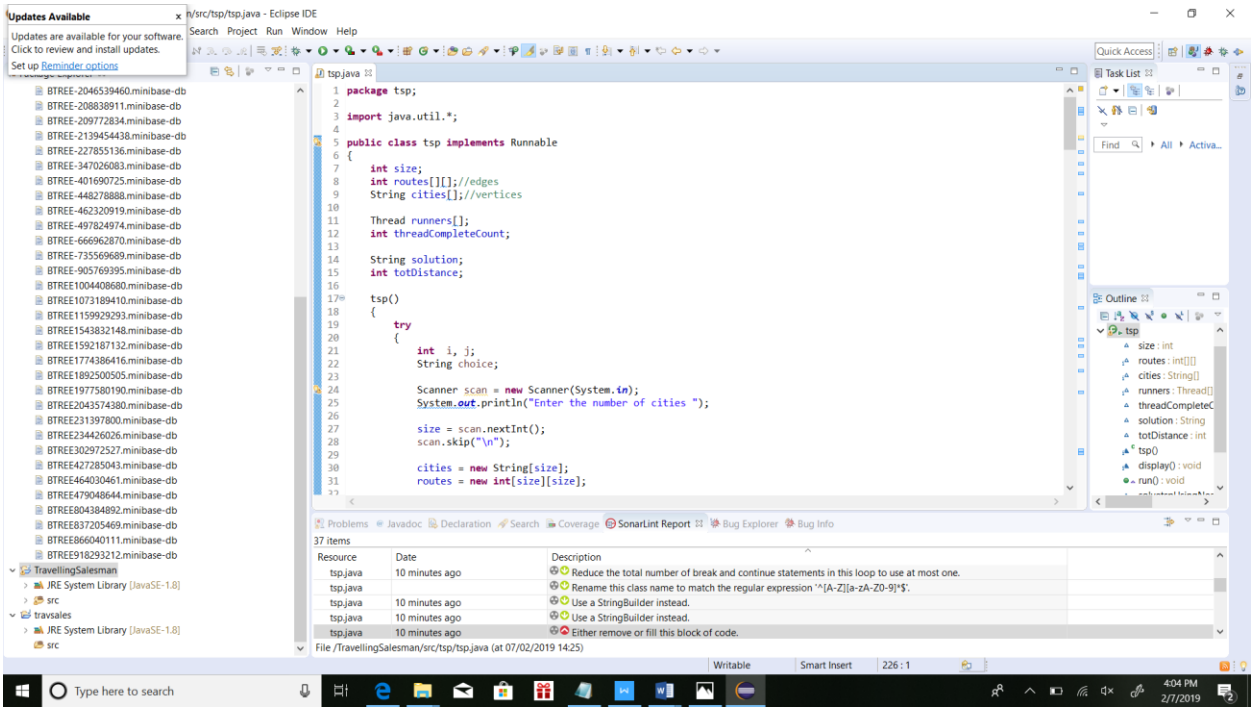
```
                    System.out.println("Enter distance : ");
                    routes[i][j] = routes[j][i] = scan.nextInt();
                    scan.skip("\n");
                }
                else
                {//no route
                    routes[i][j] = routes[j][i] = 999;
                }
            }//for(j
        }//for(i


        threadCompleteCount = 0;
        solution = "Nearest Neighbour Algorithm couldnt form a tour to visit all
cities";
        totDistance = 999;

        runners = new Thread[size];
        for(i =0 ; i< size; i++)
        {
            runners[i]= new Thread(this, String.valueOf(i));
            runners[i].start();
        }
    }
    catch(Exception ex)
    {
        System.out.println("Err : "+ ex);
    }
}//tsp()


void display()
{
    int i, j;
    for(i = 0; i< size; i++)
    {
        System.out.println();
        System.out.print(cities[i] + " :  ");
        for(j =0; j< size; j++)
        {
            System.out.print( cities[j] + "(" + routes[i][j] + ")   ");
        }
    }//for(i ...
    System.out.println();
}

public void run()
{
    int sPos = Integer.parseInt(Thread.currentThread().getName());
    solvetspUsingNearestNeighbour(sPos);
    threadCompleteCount++;
}

boolean solvetspUsingNearestNeighbour(int startPos)
{
```

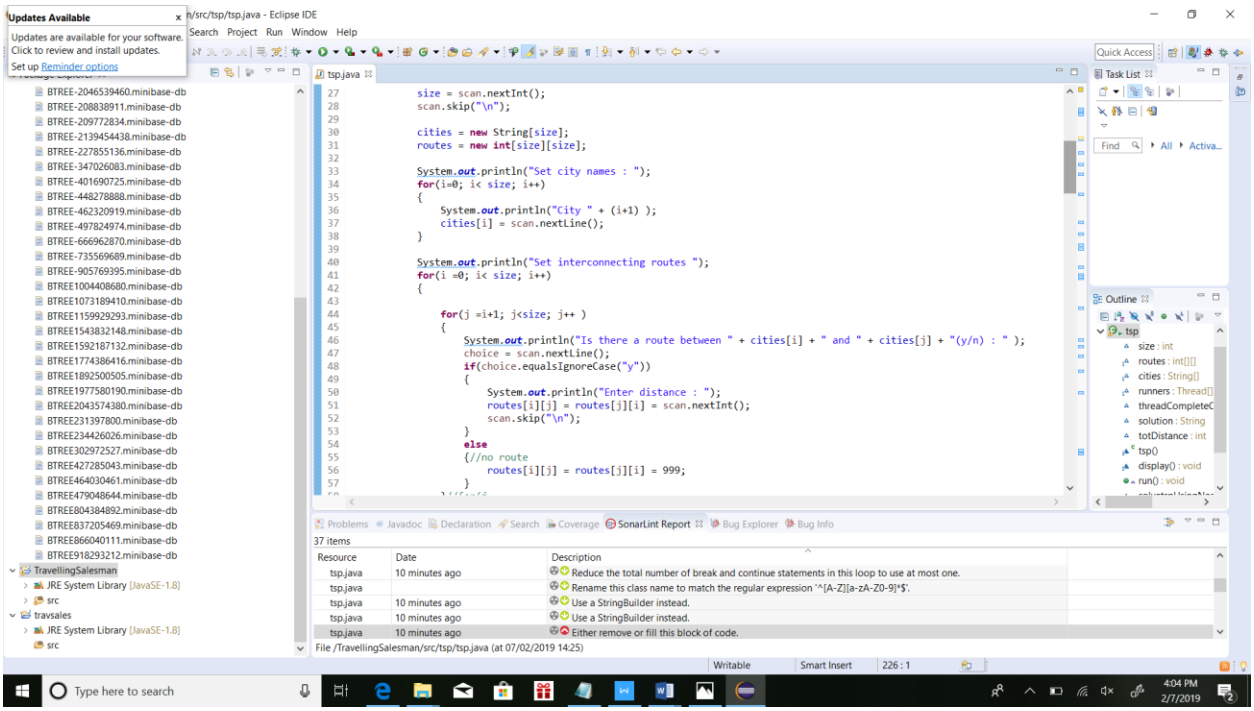
```
        boolean isTourComplete = false;
        try
        {
            String solution = "";
            int i, j, min,  currentPos, nextPos,  totDistance;
            int visitedCities[];
            int vi;

            //initializations and allocations

            visitedCities = new int[size];
            vi =0 ;
            totDistance = 0;

            //mark startPos as visited
            visitedCities[vi] = startPos;
            vi++;

            solution = cities[startPos];

            currentPos = startPos;
            //tour

            while(! isTourComplete)
            {
                nextPos = -1;
                min = 999;

                for(i =0; i < size; i++)
                {
                    if(routes[currentPos][i] != 999 && currentPos != i)
                    {
                        int flag = 0;

                        //check for being unvisited
                        for(j =0; j < vi; j++)
                        {
                            if(visitedCities[j] == i)
                            {
                                flag = 1;
                                break;
                            }
                        }//for(j ...

                        if(flag == 0)
                        {//unvisited
                            if(routes[currentPos][i] < min)
                            {
                                min = routes[currentPos][i];
                                nextPos = i;
                            }
                        }
                    }//if(routes...

                }//for(i ...
```

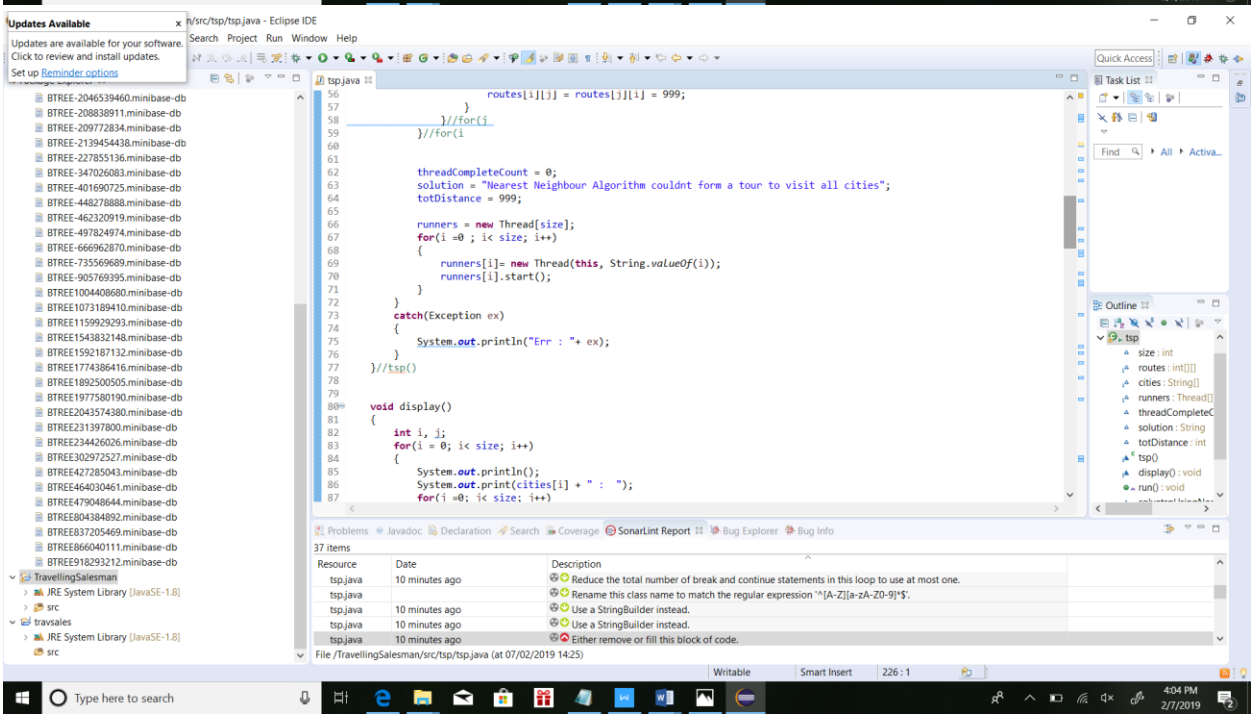
```
                if(nextPos != -1)
                {//move to next city
                    totDistance += min;
                    visitedCities[vi] = nextPos;
                    vi++;
                    solution = solution + "  " + cities[nextPos];
                    currentPos = nextPos;
                }
                else
                {
                    break;
                }

                if(vi == size)
                {
                    //tour back to start city
                    if(routes[currentPos][startPos] != 999)
                    {
                        solution = solution + "  " + cities[startPos];
                        totDistance += routes[currentPos][startPos];
                        isTourComplete = true;
                        if(totDistance < this.totDistance)
                        {
                            this.totDistance = totDistance;
                            this.solution = solution + "\nTotal Distance : " +
totDistance;

                        }
                    }
                    else
                    {
                        isTourComplete = false;
                        break;
                    }
                }
            }//while

        }
        catch(Exception ex)
        {
            solution = "Err : " + ex.getMessage();
        }
        return isTourComplete;
    }

    void displaySolution()
    {

        while(threadCompleteCount < size)
        {
            try
            {
                Thread.sleep(1000);
            }
            catch(Exception ex)
```

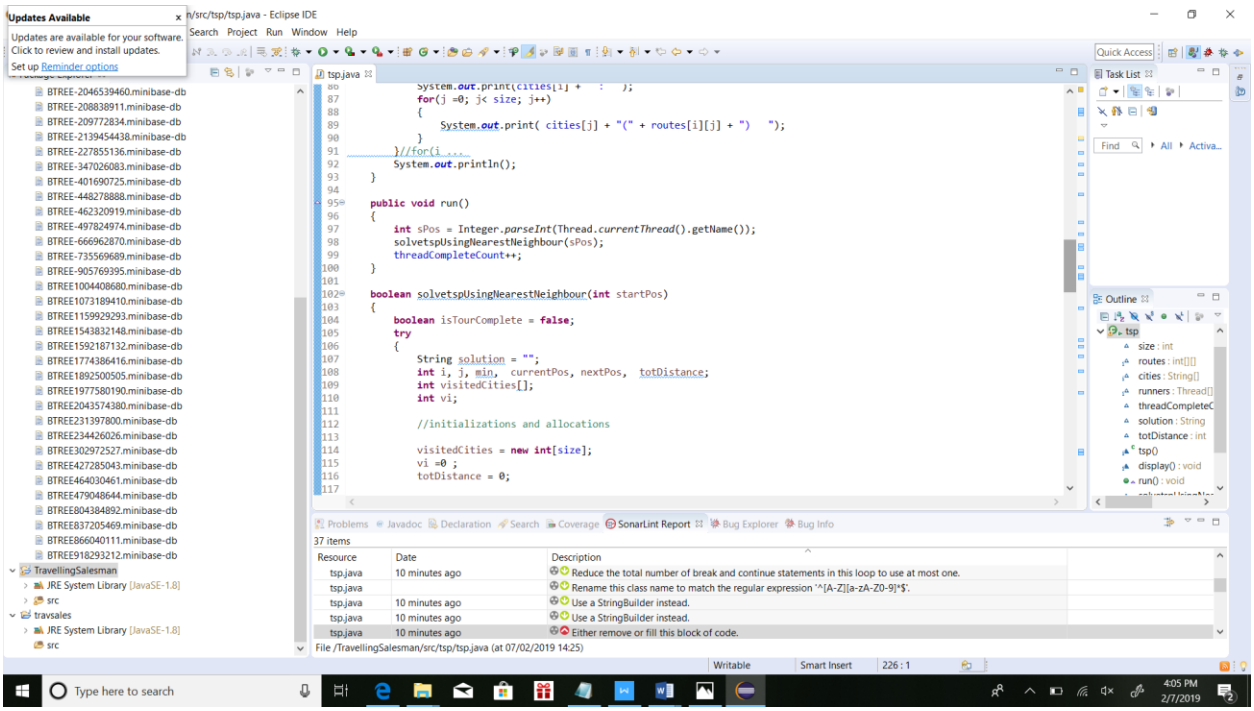
```
            {}
        }//while
        System.out.println("Solution : " + solution);
    }

    public static void main(String[] args)
    {

        tsp tsp = new tsp();
        tsp.display();
           tsp.displaySolution();

    }

}
```

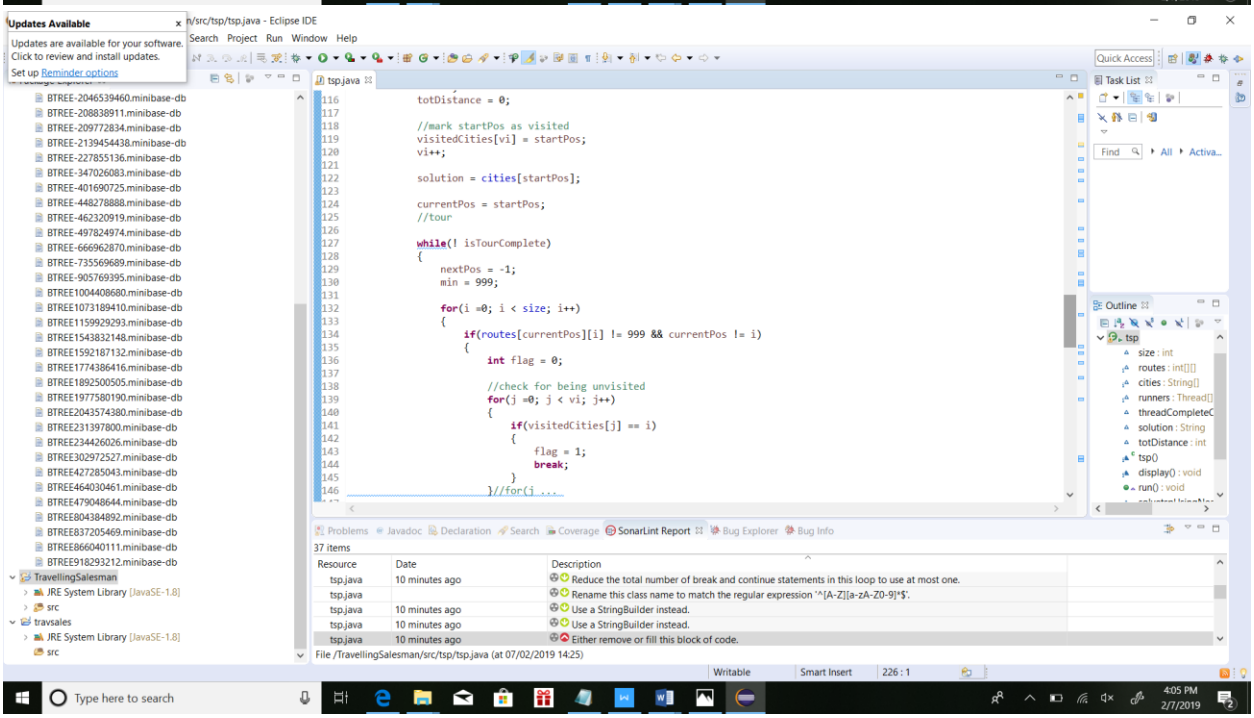
Screenshots of Code:

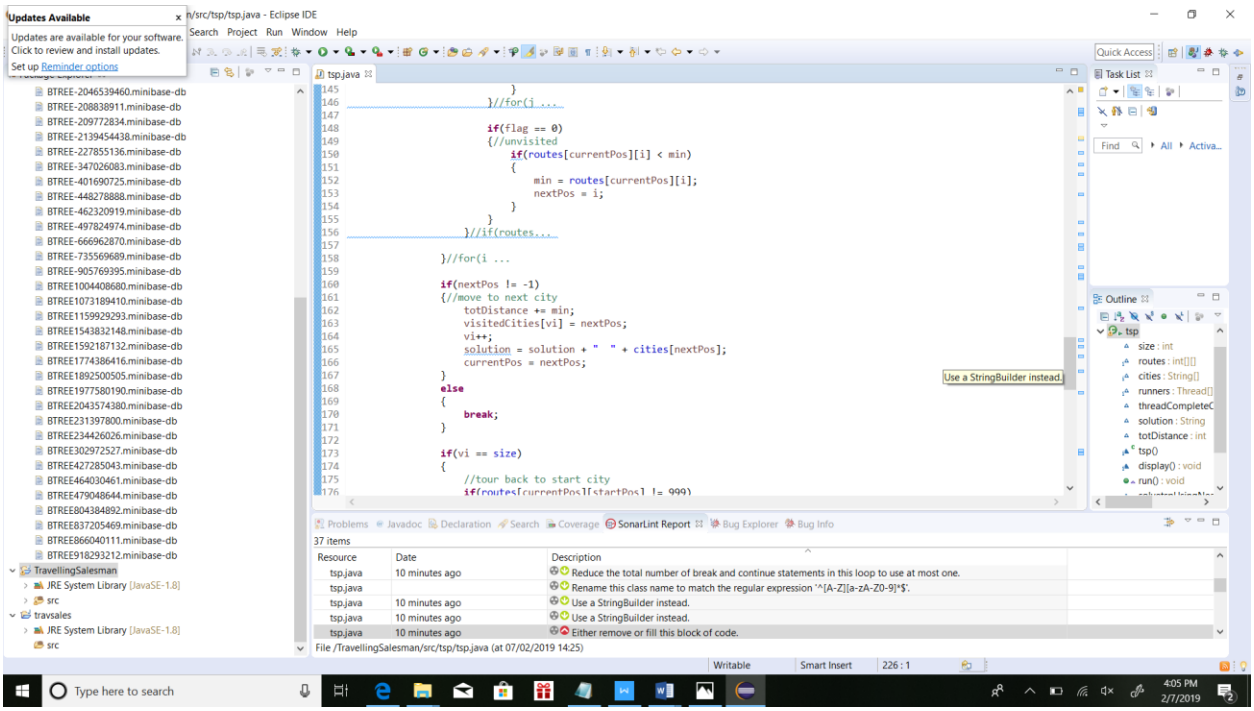


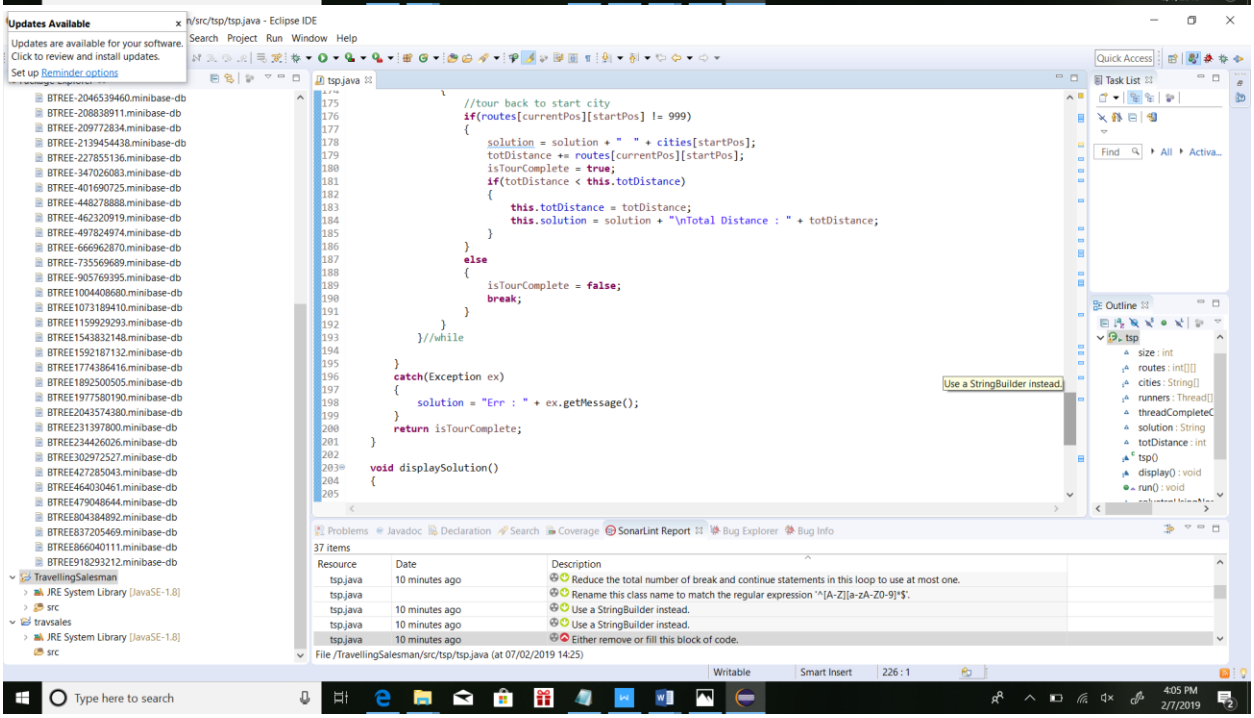

Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
tsp.java
size = scan.nextInt();
scan.skip("\n");
cities = new String[size];
routes = new int[size][size];
System.out.println("Set city names : ");
for(i=0; i< size; i++)
{
System.out.println("City " + (i+1));
cities[i] = scan.nextLine();
}
System.out.println("Set interconnecting routes ");
for(i =0; i< size; i++)
{
for(j =i+1; j<size; j++)
{
System.out.println("Is there a route between " + cities[i] + " and " + cities[j] + "(y/n) : ");
choice = scan.nextLine();
if(choice.equalsIgnoreCase("y"))
{
System.out.println("Enter distance : ");
routes[i][j] = routes[j][i] = scan.nextInt();
scan.skip("\n");
}
else
{//no route
routes[i][j] = routes[j][i] = 999;
}
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:04 PM
2/7/2019

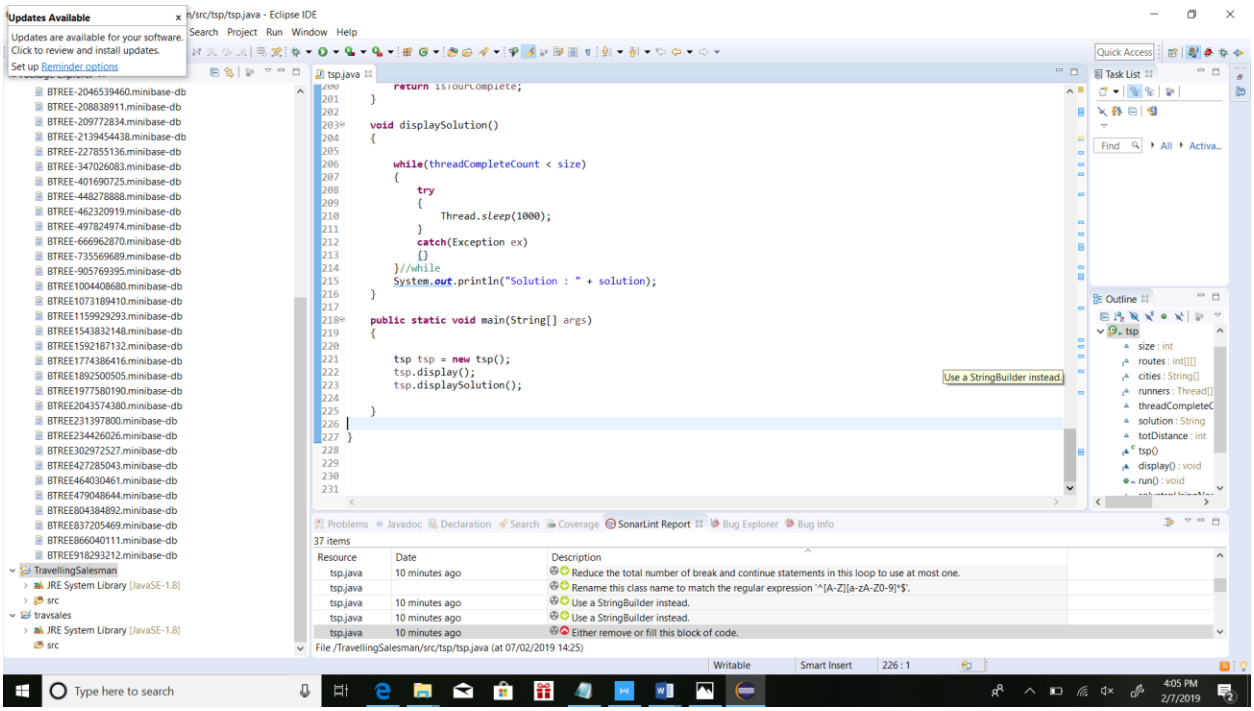

Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
tsp.java
routes[i][j] = routes[j][i] = 999;
}
}//for(j
}//for(i
threadCompleteCount = 0;
solution = "Nearest Neighbour Algorithm couldnt form a tour to visit all cities";
totDistance = 999;
runners = new Thread[size];
for(i =0 ; i< size; i++)
{
runners[i]= new Thread(this, String.valueOf(i));
runners[i].start();
}
}
catch(Exception ex)
{
System.out.println("Err : "+ ex);
}
}//tsp()
void display()
{
int i, j;
for(i = 0; i< size; i++)
{
System.out.println();
System.out.print(cities[i] + " : ");
for(i =0; i< size; i++)
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:04 PM
2/7/2019


Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
tsp.java
System.out.print(cities[i] + " : ");
for(j =0; j< size; j++)
{
System.out.print(cities[j] + "(" + routes[i][j] + ") ");
}//for(j ...
System.out.println();
}
public void run()
{
int sPos = Integer.parseInt(Thread.currentThread().getName());
solvetspUsingNearestNeighbour(sPos);
threadCompleteCount++;
}
boolean solvetspUsingNearestNeighbour(int startPos)
{
boolean isTourComplete = false;
try
{
String solution = "";
int i, j, min, currentPos, nextPos, totDistance;
int visitedCities[];
int vi;
//initializations and allocations
visitedCities = new int[size];
vi =0 ;
totDistance = 0;
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:05 PM
2/7/2019


Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
tsp.java
totDistance = 0;
//mark startPos as visited
visitedCities[vi] = startPos;
vi++;
solution = cities[startPos];
currentPos = startPos;
//tour
while(! isTourComplete)
{
nextPos = -1;
min = 999;
for(i =0; i < size; i++)
{
if(routes[currentPos][i] != 999 && currentPos != i)
{
int flag = 0;
//check for being unvisited
for(j =0; j < vi; j++)
{
if(visitedCities[j] == i)
{
flag = 1;
break;
}
}//for(j ...
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:05 PM
2/7/2019


Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
tsp.java
}//for(j ...
if(flag == 0)
{//unvisited
if(routes[currentPos][i] < min)
{
min = routes[currentPos][i];
nextPos = i;
}
}
}//if(routes...
}//for(i ...
if(nextPos != -1)
{//move to next city
totDistance += min;
visitedCities[vi] = nextPos;
vi++;
solution = solution + " " + cities[nextPos];
currentPos = nextPos;
}
else
{
break;
}
if(vi == size)
{
//tour back to start city
if(routes[currentPos][startPos] != 999)
Use a StringBuilder instead.
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:05 PM
2/7/2019


Updates Available
Updates are available for your software. Click to review and install updates.
Set up Reminder options
Search Project Run Window Help
Quick Access
Task List
Find All Activa...
tsp.java
//tour back to start city
if(routes[currentPos][startPos] != 999)
{
solution = solution + " " + cities[startPos];
totDistance += routes[currentPos][startPos];
isTourComplete = true;
if(totDistance < this.totDistance)
{
this.totDistance = totDistance;
this.solution = solution + "\nTotal Distance : " + totDistance;
}
}
else
{
isTourComplete = false;
break;
}
}
}//while
}
catch(Exception ex)
{
solution = "Err : " + ex.getMessage();
}
return isTourComplete;
}
void displaySolution()
{
Use a StringBuilder instead.
Outline
tsp
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info
37 items
Resource Date Description
tsp.java 10 minutes ago Reduce the total number of break and continue statements in this loop to use at most one.
tsp.java Rename this class name to match the regular expression '^[A-Z][a-zA-Z0-9]*$'.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Use a StringBuilder instead.
tsp.java 10 minutes ago Either remove or fill this block of code.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 14:25)
Writable Smart Insert 226 : 1
TravellingSalesman
JRE System Library [JavaSE-1.8]
src
travsales
JRE System Library [JavaSE-1.8]
src
Type here to search
4:05 PM
2/7/2019



Tool used: SonarLint 4.1

Severity of SonarLint markers: Info

Code Smell:

1)Number of major Code Smells: 21

2) Number of minor Code Smells: 15

3)Number of critical Code Smells: 1

37 items reported in total

Code Smell Fixes done:

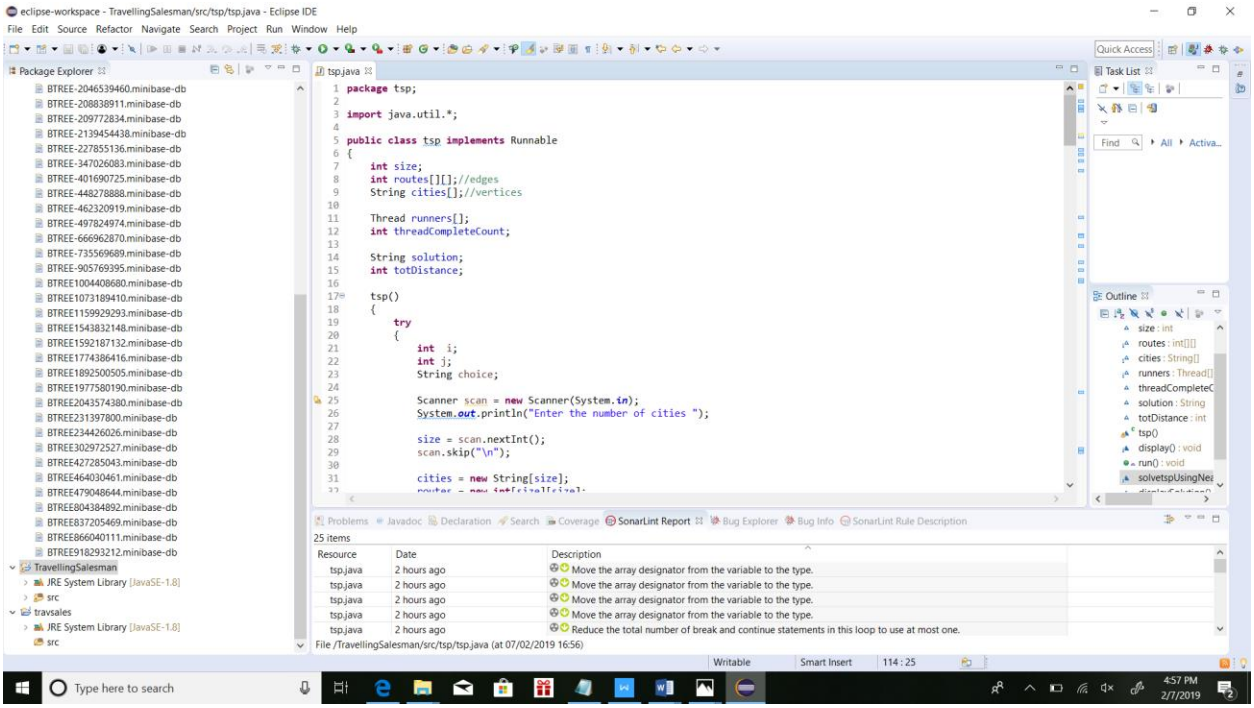
Lines 91,58,59,156,158, 146:

Issue was: This block of commented-out lines of code should be removed.

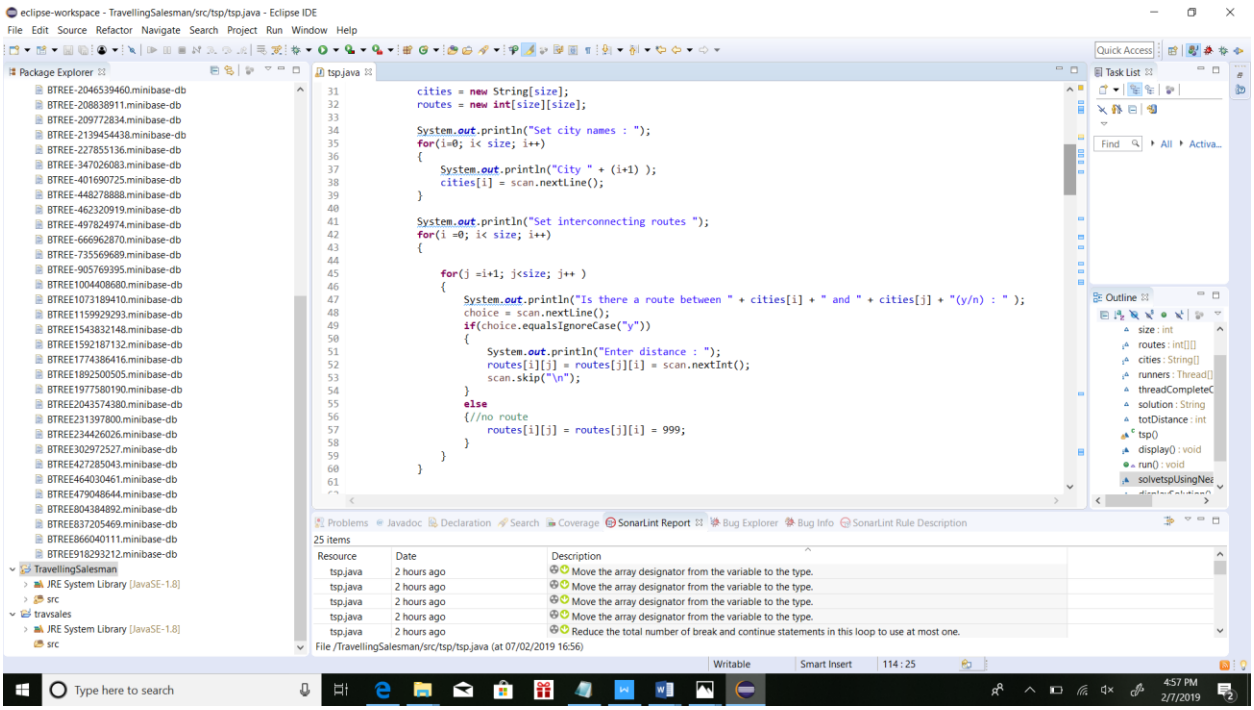
Lines 108,82,21:

Issue was: Variable Declaration should be done on a separate line.

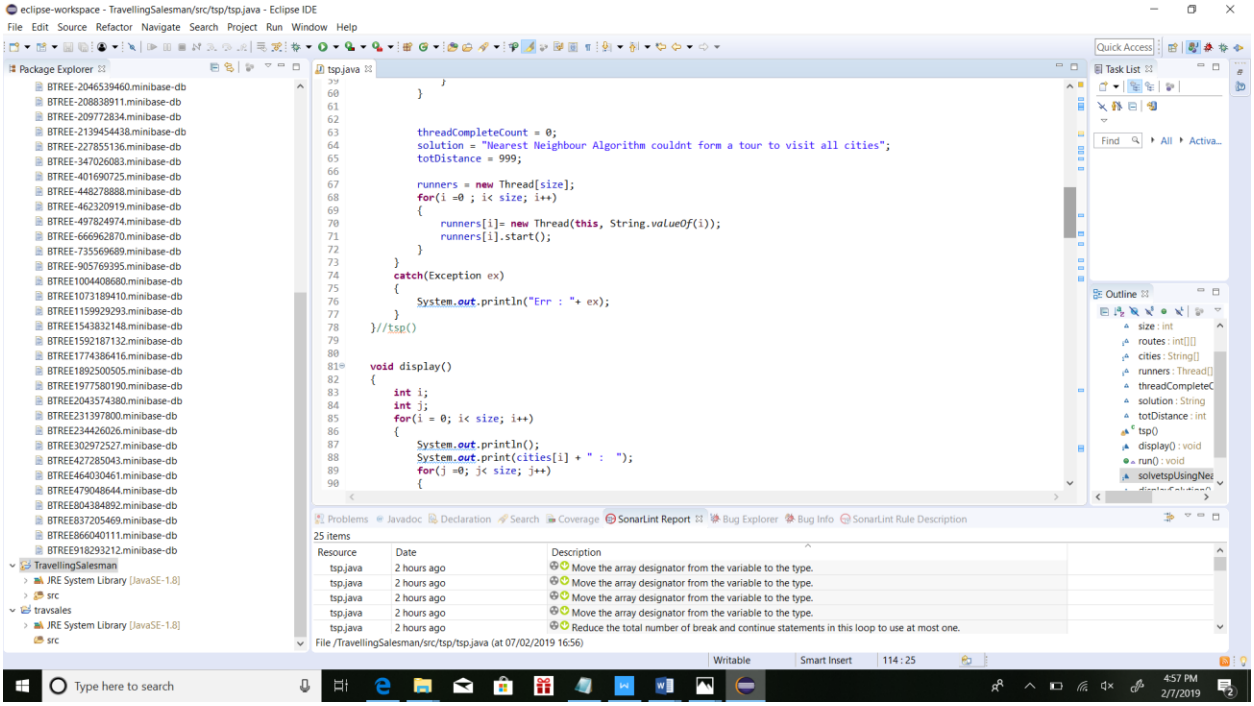
Screenshots of fixes done:

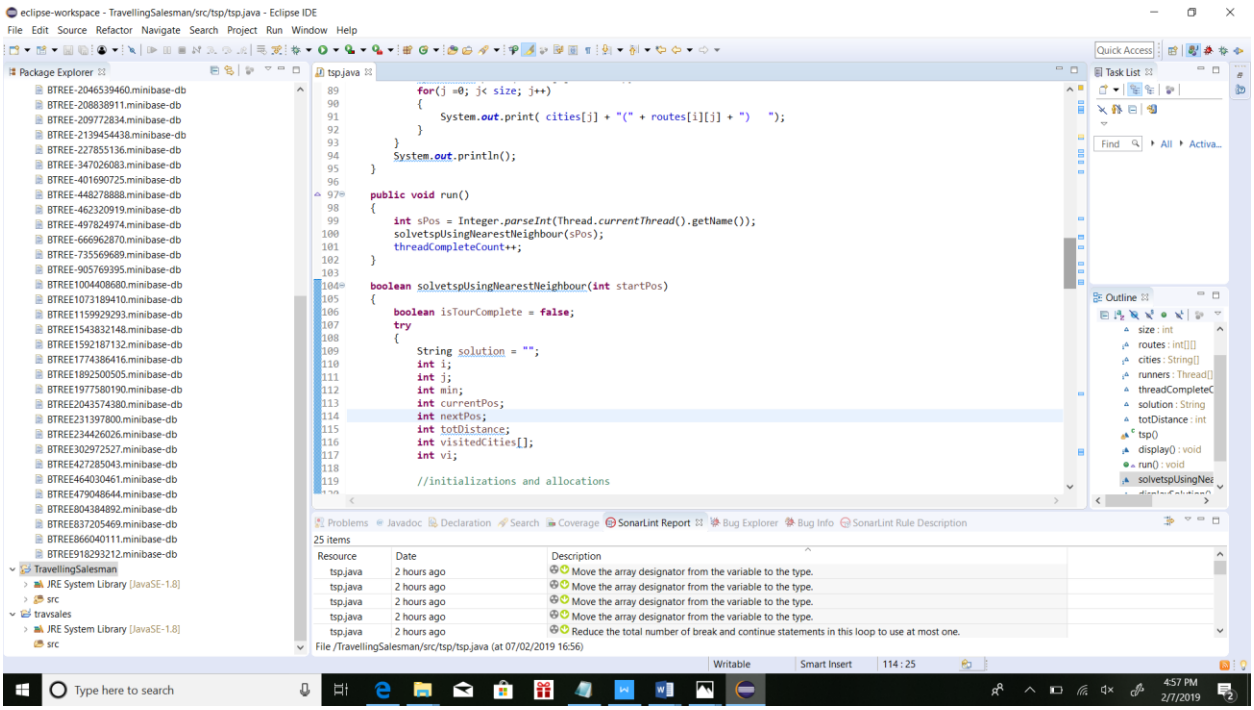


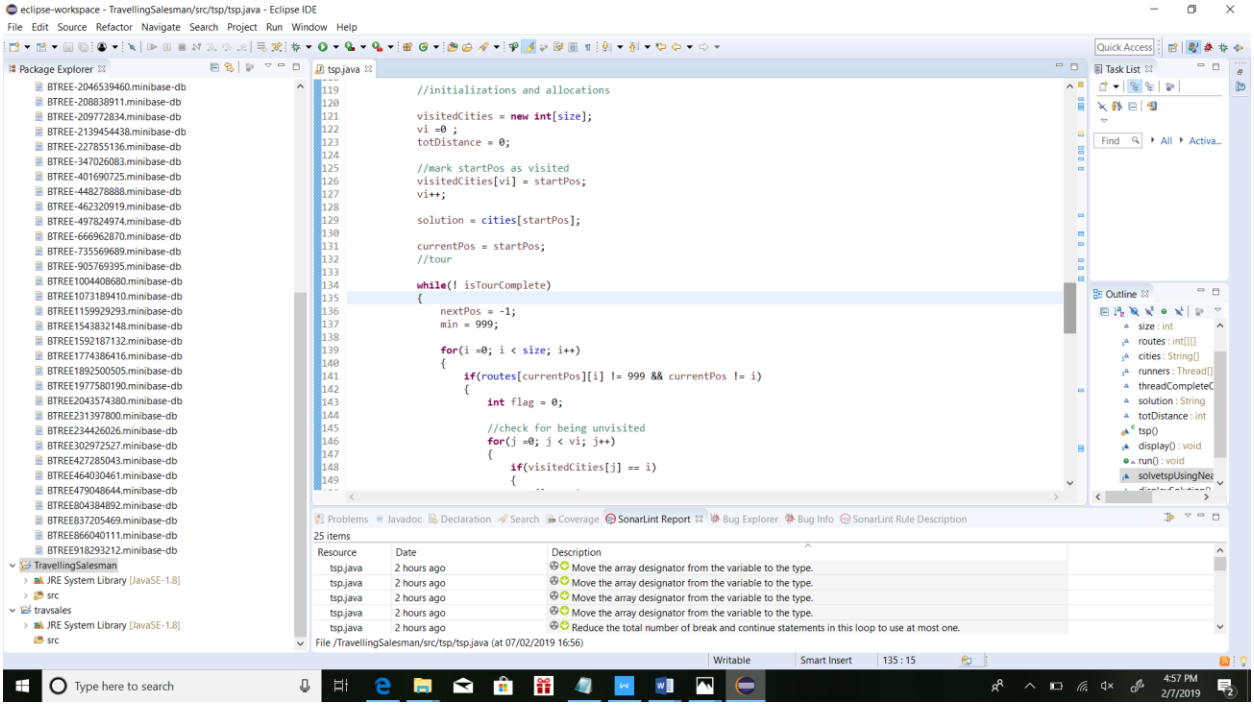

```java
package tsp;

import java.util.*;

public class tsp implements Runnable
{
    int size;
    int routes[][];//edges
    String cities[];//vertices

    Thread runners[];
    int threadCompleteCount;

    String solution;
    int totDistance;

    tsp()
    {
        try
        {
            int  i;
            int j;
            String choice;

            Scanner scan = new Scanner(System.in);
            System.out.println("Enter the number of cities ");

            size = scan.nextInt();
            scan.skip("\n");

            cities = new String[size];
```

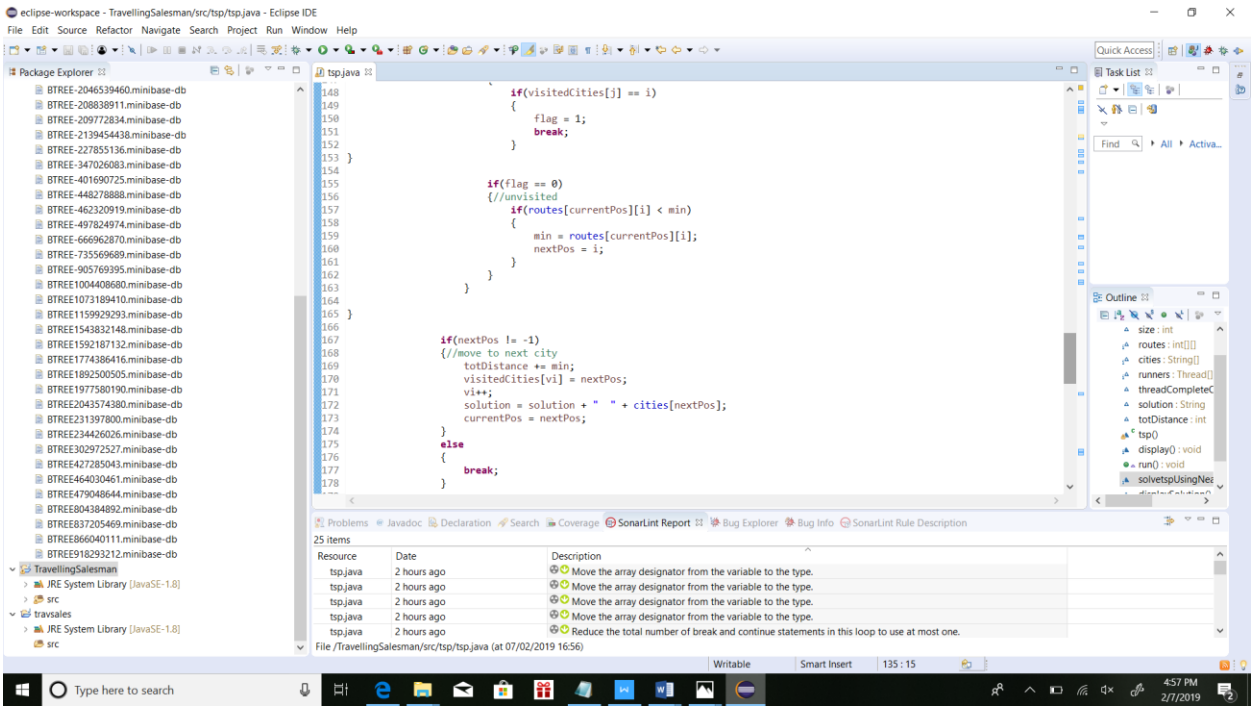


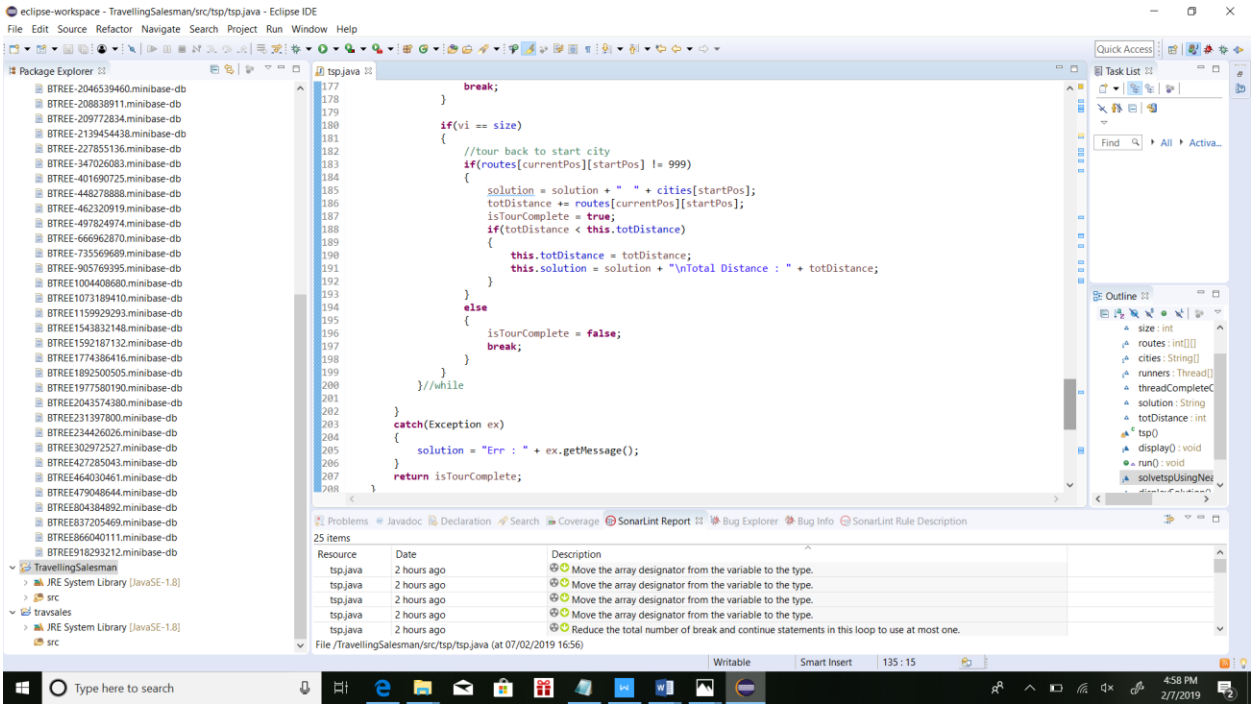

```java
            cities = new String[size];
            routes = new int[size][size];

            System.out.println("Set city names : ");
            for(i=0; i< size; i++)
            {
                System.out.println("City " + (i+1) );
                cities[i] = scan.nextLine();
            }

            System.out.println("Set interconnecting routes ");
            for(i =0; i< size; i++)
            {

                for(j =i+1; j<size; j++ )
                {
                    System.out.println("Is there a route between " + cities[i] + " and " + cities[j] + "(y/n) : " );
                    choice = scan.nextLine();
                    if(choice.equalsIgnoreCase("y"))
                    {
                        System.out.println("Enter distance : ");
                        routes[i][j] = routes[j][i] = scan.nextInt();
                        scan.skip("\n");
                    }
                    else
                    {//no route
                        routes[i][j] = routes[j][i] = 999;
                    }
                }
            }
```

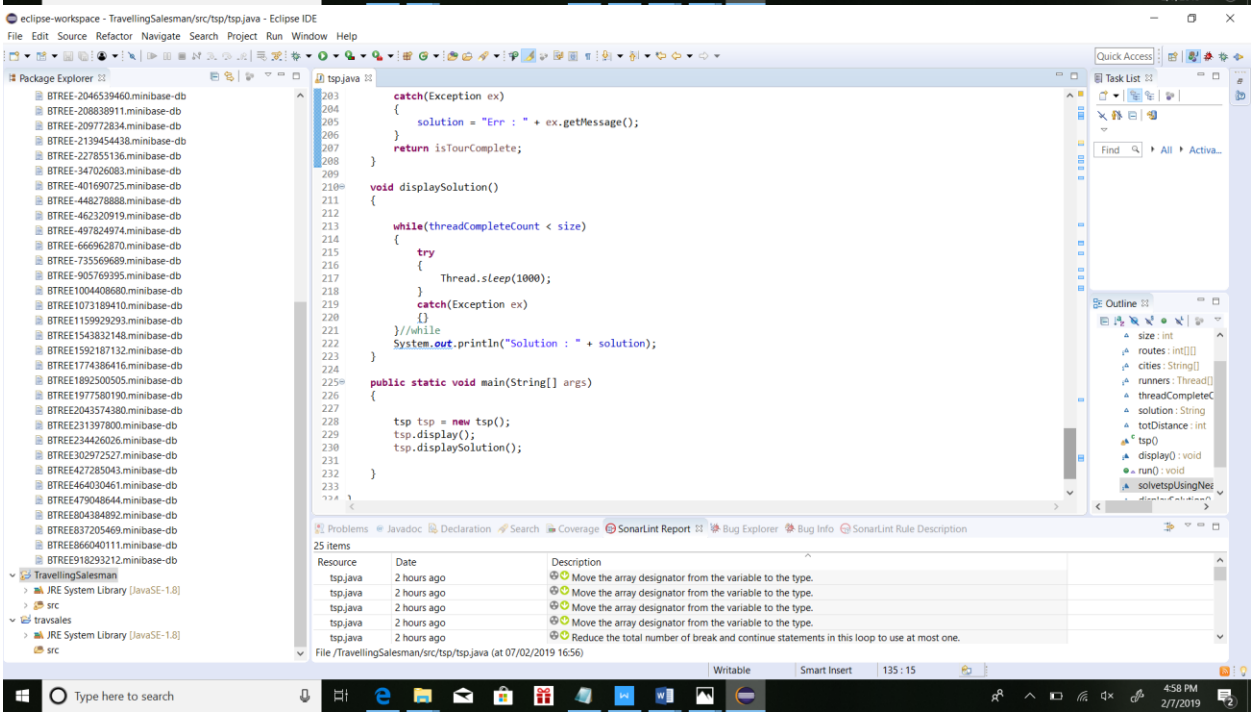

eclipse-workspace - TravellingSalesman/src/tsp/tsp.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
tsp.java
Task List
Outline
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info SonarLint Rule Description
25 items
Resource Date Description
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Reduce the total number of break and continue statements in this loop to use at most one.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 16:56)
Writable Smart Insert 114 : 25
Type here to search
4:57 PM 2/7/2019


eclipse-workspace - TravellingSalesman/src/tsp/tsp.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
tsp.java
Task List
Outline
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info SonarLint Rule Description
25 items
Resource Date Description
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Reduce the total number of break and continue statements in this loop to use at most one.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 16:56)
Writable Smart Insert 114 : 25
Type here to search
4:57 PM 2/7/2019


eclipse-workspace - TravellingSalesman/src/tsp/tsp.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
tsp.java
//initializations and allocations
visitedCities = new int[size];
vi =0 ;
totDistance = 0;
//mark startPos as visited
visitedCities[vi] = startPos;
vi++;
solution = cities[startPos];
currentPos = startPos;
//tour
while(! isTourComplete)
nextPos = -1;
min = 999;
for(i =0; i < size; i++)
if(routes[currentPos][i] != 999 && currentPos != i)
int flag = 0;
//check for being unvisited
for(j =0; j < vi; j++)
if(visitedCities[j] == i)
Task List
Outline
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
solvetspUsingNea
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info SonarLint Rule Description
25 items
Resource Date Description
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Reduce the total number of break and continue statements in this loop to use at most one.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 16:56)
Writable Smart Insert 135 : 15
Type here to search
4:57 PM
2/7/2019


eclipse-workspace - TravellingSalesman/src/tsp/tsp.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
tsp.java
if(visitedCities[j] == i)
flag = 1;
break;
if(flag == 0)
//unvisited
if(routes[currentPos][i] < min)
min = routes[currentPos][i];
nextPos = i;
if(nextPos != -1)
//move to next city
totDistance += min;
visitedCities[vi] = nextPos;
vi++;
solution = solution + " " + cities[nextPos];
currentPos = nextPos;
else
break;
Task List
Outline
size : int
routes : int[][]
cities : String[]
runners : Thread[]
threadCompleteC
solution : String
totDistance : int
tsp()
display() : void
run() : void
solvetspUsingNea
Problems Javadoc Declaration Search Coverage SonarLint Report Bug Explorer Bug Info SonarLint Rule Description
25 items
Resource Date Description
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Move the array designator from the variable to the type.
tsp.java 2 hours ago Reduce the total number of break and continue statements in this loop to use at most one.
File /TravellingSalesman/src/tsp/tsp.java (at 07/02/2019 16:56)
Writable Smart Insert 135 : 15
Type here to search
4:57 PM
2/7/2019





Thus, as seen from the screenshots the number of reported items dropped from 37 to 25 due to the fixes mentioned above.